CLAIMS

1. A method for transmitting data in a multiple-access multiple-input multiple-output (MIMO) communication system, comprising:

selecting one or more terminals for data transmission;

receiving channel state information (CSI) indicative of channel conditions for the one or more selected terminals;

processing data for the one or more selected terminals based on the received CSI to provide a plurality of modulated signals; and

transmitting the plurality of modulated signals via a plurality of transmit antennas to the one or more selected terminals.

2. The method of claim 1, wherein the system is configurable to transmit data via a plurality of operating modes.

3. The method of claim 2, wherein the plurality of operating modes include a single-user MIMO mode characterized by use of the plurality of transmit antennas for data transmission to a single terminal having a plurality of receive antennas.

4. The method of claim 3, wherein the data transmission to the single terminal in the single-user MIMO mode comprises a plurality of data streams transmitted on the plurality of modulated signals.

5. The method of claim 2, wherein the plurality of operating modes include a multi-user MIMO mode characterized by use of the plurality of transmit antennas for data transmission to a plurality of terminals collectively having a plurality of receive antennas.

6. The method of claim 5, wherein one modulated signal is designated for each of the plurality of terminals in the multi-user MIMO mode.

7. The method of claim 2, wherein the plurality of operating modes include a mixed mode characterized by use of the plurality of transmit antennas for data

transmission to a combination of SIMO and MIMO terminals, wherein one modulated signal is designated for each SIMO terminal and multiple modulated signals are designated for each MIMO terminal.

8. The method of claim 2, wherein the plurality of operating modes include a diversity mode characterized by use of the plurality of transmit antennas for reliable transmission of a single data stream to a single terminal having a plurality of receive antennas.

9. The method of claim 2, wherein the plurality of operating modes include a transmit diversity mode characterized by use of the plurality of transmit antennas for data transmission to a single terminal having a single receive antenna.

10. The method of claim 1, wherein terminals are selected for data transmission based on estimated signal-to-noise-plus-interference ratios (SNRs) achieved for the plurality of transmit antennas.

11. The method of claim 10, wherein the SNRs are derived at the terminals based on pilots included in the plurality of modulated signals.

12. The method of claim 1, wherein terminals are selected for data transmission based on RF characterization of a MIMO channel formed by the plurality of transmit antennas and a plurality of receive antennas at the terminals.

13. The method of claim 12, wherein the RF characterization is derived at the terminals based on pilots included in the plurality of modulated signals.

14. The method of claim 1, further comprising:

assigning the plurality of transmit antennas to the one or more selected terminals based on the received CSI.

15. The method of claim 1, further comprising:

assigning each selected terminal to one or more transmit antennas.

16. The method of claim 1, wherein terminals are selected for data transmission based on one or more metrics.

17. The method of claim 16, wherein one of the one or more metrics is indicative of throughput achievable for the selected terminals.

18. The method of claim 16, wherein one of the one or more metrics is a function based on SNR achieved for the selected terminals.

19. The method of claim 1, wherein terminals are selected for data transmission based on their priorities.

20. The method of claim 19, wherein the priority of a particular terminal is determined based on an average throughput of the terminal.

21. The method of claim 1, wherein the processing includes coding and modulating the data for the one or more selected terminals based on the received CSI.

22. The method of claim 10, further comprising: coding and modulating data for each modulated signal based on estimated SNRs at the terminal for the modulated signal.

23. The method of claim 12, further comprising: preconditioning modulation symbols based on an eigenvector matrix formed by the RF characterization for the one or more selected terminals.

24. The method of claim 1, wherein the processing includes adjusting data rates for the one or more selected terminals based on the received CSI.

25. The method of claim 1, further comprising:

receiving feedback from the one or more selected terminals; and

adjusting at least one characteristic of the modulated signals based on the received feedback.

26. The method of claim 25, wherein transmit power for the modulated signals is adjusted based on the received feedback.

27. The method of claim 25, wherein data rates for the modulated signals are adjusted based on the received feedback.

28. The method of claim 25, wherein coding and modulation of the data for the modulated signals are adjusted based on the received feedback.

29. The method of claim 1, wherein the plurality of modulated signals are transmitted at power levels determined in part by one or more power back-off factors indicative of maximum allowed power levels.

30. The method of claim 29, wherein the one or more power back-off factors are selected to reduce interference to adjacent cells.

31. The method of claim 29, wherein the one or more power back-off factors are selected based on system loading.

32. The method of claim 29, wherein the one or more power back-off factors are selected based on achievable performance by terminals within the system.

33. The method of claim 1, wherein the CSI comprises estimated signal-to-noise-plus-interference ratios (SNRs) for a plurality of transmission channels used for data transmission.

34. The method of claim 1, wherein the CSI comprises indications of data rates supported by a plurality of transmission channels used for data transmission.

35. The method of claim 33, wherein the SNRs are derived based on spatial processing at the terminals.

36. The method of claim 35, wherein the spatial processing at a terminal comprises a channel correlation matrix inversion (CCMI) technique or a minimum mean square error (MMSE) technique.

37. The method of claim 33, wherein the SNRs are derived based on space-time processing at the terminals.

38. The method of claim 37, wherein the space-time processing comprises an MMSE linear equalizer (MMSE-LE) technique or a decision feedback equalizer (DFE) technique.

39. The method of claim 33, wherein the SNRs are derived based on successive cancellation receiver processing at the terminals.

40. The method of claim 1, wherein the system implements orthogonal frequency division multiplex (OFDM).

41. The method of claim 1, wherein the system implements code division multiple access (CDMA).

42. A method for transmitting data on a downlink in a multiple-access multiple-input multiple-output (MIMO) communication system, comprising:

receiving estimated signal-to-noise-plus-interference ratios (SNRs) achieved at a plurality of terminals for a plurality of transmit antennas;

selecting one or more terminals for data transmission based on the estimated SNRs;

processing data for the one or more selected terminals based on the estimated SNRs to provide a plurality of modulated signals; and

transmitting the plurality of modulated signals via the plurality of transmit antennas to the one or more selected terminals, and

wherein the system is configurable to transmit data via a plurality of operating modes comprised of a single-user MIMO mode, a multi-user MIMO mode, and a mixed mode.

43. A method for transmitting data in a multiple-access multiple-input multiple-output (MIMO) communication system, comprising:

receiving channel state information (CSI) indicative of channel conditions for a plurality of terminals;

selecting one or more terminals for uplink data transmission;

sending information indicative of at least one transmission parameter to the one or more selected terminals;

receiving, via a plurality of receive antennas, a plurality of modulated signals from the one or more selected terminals; and

processing a plurality of received signals to recover data transmitted by the one or more selected terminals.

44. The method of claim 43, wherein terminals are selected for data transmission based on estimated signal-to-noise-plus-interference ratios (SNRs) for a plurality of available transmission channels.

45. The method of claim 43, wherein terminals are selected for data transmission based on RF characterization of a MIMO channel formed by transmit antennas at the terminals and the plurality of receive antennas.

46. The method of claim 43, wherein terminals are selected for data transmission based in part on one or more power back-off factors indicative of maximum allowed power levels.

47. The method of claim 44, wherein the SNRs are derived based on spatial processing.

48. The method of claim 44, wherein the SNRs are derived based on space-time processing.

49. The method of claim 44, wherein the SNRs are derived based on successive cancellation receiver processing.

50. A base station in a multiple-access multiple-input multiple-output (MIMO) communication system, comprising:

a scheduler operative to select one or more terminals for data transmission;

a controller operative to receive channel state information (CSI) indicative of channel conditions for the one or more selected terminals and to provide one or more controls based on the received CSI;

a TX data processor operative to process data for the one or more selected terminals based on the one or more controls to provide a plurality of modulation symbol streams;

a modulator operative to generate a plurality of modulated signals for the plurality of modulation symbol streams; and

a plurality of transmit antennas configured to transmit the modulated signals to the one or more selected terminals.

51. A base station in a multiple-access multiple-input multiple-output (MIMO) communication system, comprising:

means for selecting one or more terminals for data transmission;

means for receiving channel state information (CSI) indicative of channel conditions for the one or more selected terminals and for providing one or more controls based on the received CSI;

means for processing data for the one or more selected terminals based on the one or more controls to provide a plurality of modulation symbol streams;

means for generating a plurality of modulated signals for the plurality of modulation symbol streams; and

means for transmitting the modulated signals to the one or more selected terminals.

52. A terminal in a multiple-access multiple-input multiple-output (MIMO) communication system, comprising:

at least one front-end processor operative to receive and process at least one received signal to provide received modulation symbols;

a RX MIMO/data processor operative to receive and process the received modulation symbols in accordance with a receiver processing technique to provide estimates of modulation symbols in the transmitted signals, wherein the RX MIMO/data processor is further operative to provide channel state information (CSI) indicative of channel conditions for the plurality of transmitted signals; and

a TX data processor configured to receive and process the CSI for transmission from the terminal.

53. A terminal in a multiple-access multiple-input multiple-output (MIMO) communication system, comprising:

means for processing at least one received signal to provide received modulation symbols;

means for processing the received modulation symbols in accordance with a receiver processing technique to provide estimates of modulation symbols in the transmitted signals;

means for deriving channel state information (CSI) indicative of channel conditions for the plurality of transmitted signals; and

means for processing the CSI for transmission from the terminal.